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*Electromagnetic Clutches
and Brakes*

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*Precision Electric Coils and
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Application Support
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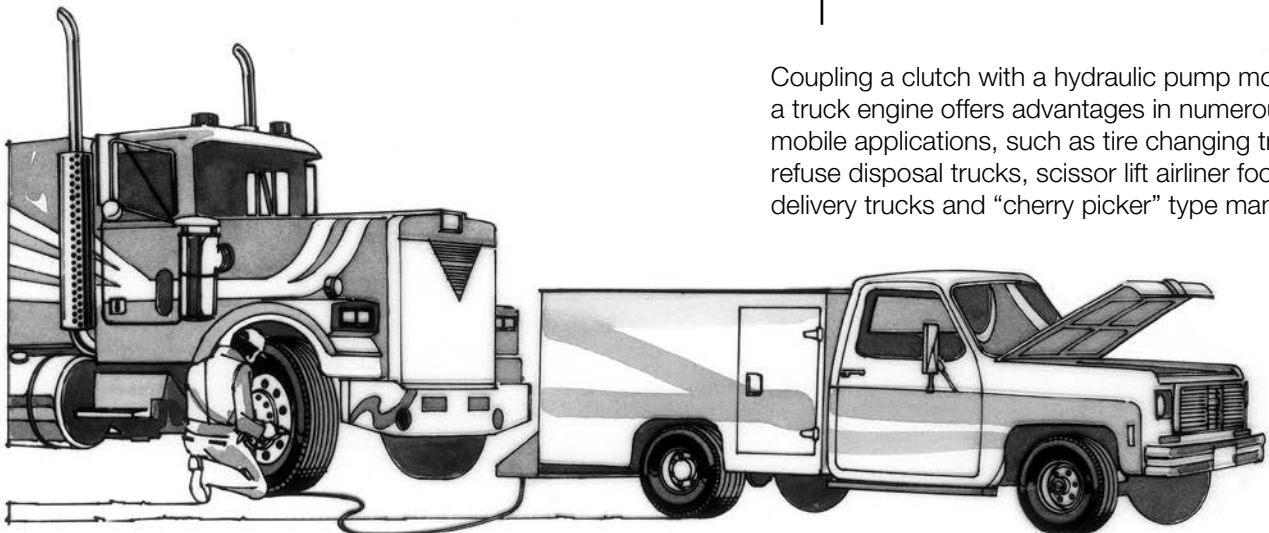
Engine, Pump and Compressor Power Take-Off Clutches

WARNER ELECTRIC™

A REGAL REXNORD BRAND

Engine, Pump and Compressor Clutches

Principles of Operation

An electric clutch operates on the basic principle of magnetic attraction. Closing a switch sends electric current to an electromagnet or "field", producing a strong magnetic attraction which concentrates around the magnetic poles of the field. The magnetic attraction jumps the small air gap between the field and the rotor, effectively making the rotor a spinning magnet. This "magnet" attracts the armature, grips it tightly and causes it to turn with the rotor. Opening the switch turns off the magnet, disengaging the clutch.

Magnetic Circuit

The heart of an electric clutch is its field assembly, with an electric coil to produce magnetism and iron magnet housing to direct that magnetism through the rotor to most effectively attract the armature. The illustration on the right shows how the rotor and armature surfaces of Warner Electric clutches are slotted and grooved. Magnetism, also called magnetic "flux", concentrates at the poles of the field housing and jumps to the outer rims of the rotor. The flux passes through areas where contact is most intimate between the armature and rotor faces. Concentrating the magnetic attraction at these poles rather than over the entire face creates a strong attraction between the armature and rotor. The result is a great deal of torque in a small clutch.

Contents

Application Examples

Coupling a clutch with a hydraulic pump mounted on a truck engine offers advantages in numerous other mobile applications, such as tire changing trucks, refuse disposal trucks, scissor lift airliner food delivery trucks and "cherry picker" type man lifts.

Premier Industrial Company Leading Brands

OTHER PRODUCT SOLUTIONS FROM **REGAL REXNORD**

Our comprehensive product offerings include various types of clutches and brakes, overrunning clutches, engineered bearing assemblies, gearing and gear motors along with linear motion products, belted drives, couplings, limit switches, precision motors, drives & controls, and miniature motors. With thousands of product solutions available, Regal Rexord provides true single source convenience while meeting specific customer requirements. Many major OEMs and end users prefer Regal Rexnord products as their No. 1 choice for performance and reliability.

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Delroyd Worm Gear
Nuttall Gear

Armature Assembly

Rotor Pulley Assembly

Air Gap

Field Assembly
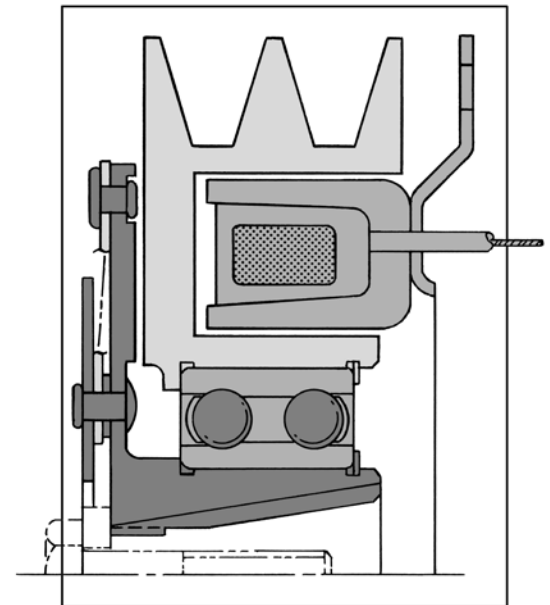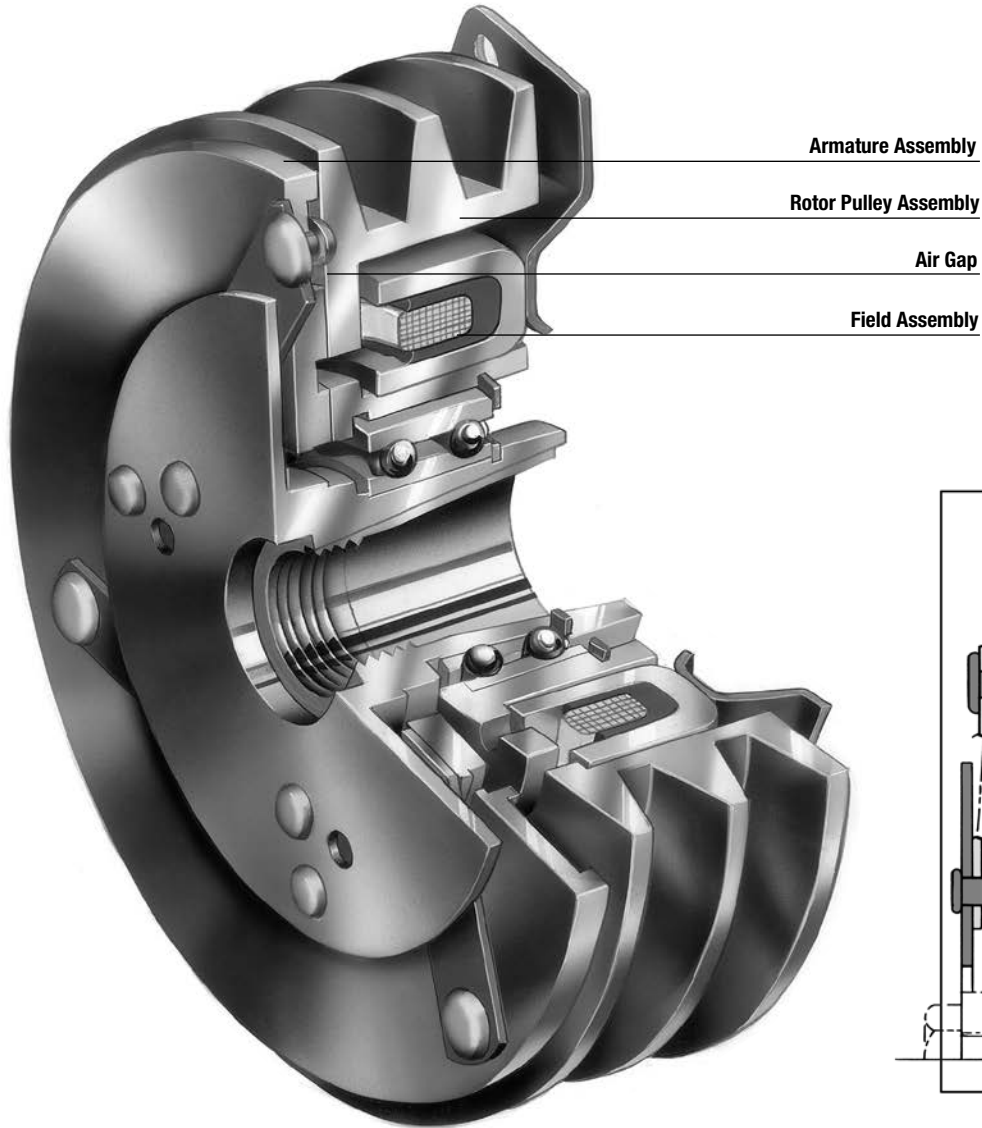
Electric clutches provide for remote control of the feed and chopping mechanisms on straw choppers, insulation blowers, and salt spreaders.
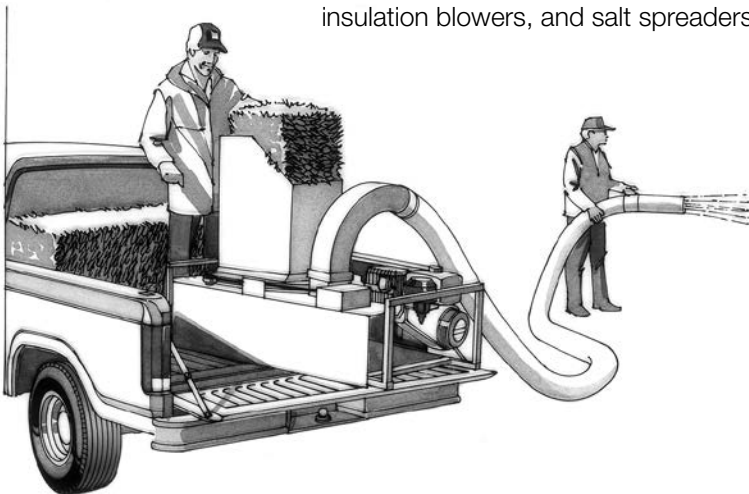
An engine mounted pump on this highway maintenance truck supplies hydraulic pressure for the sand spreader. Mounting an electric clutch on the pump will increase equipment life, improve machine efficiency, and allow the operator to engage and disengage the hydraulic system on demand.
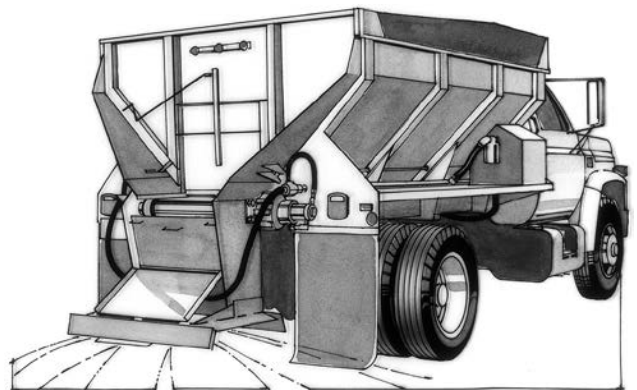
Engine, Pump and Compressor Clutches- Selection

The Right Clutch For Your Application

Several specifications must be determined to select the right Warner Electric clutch for a particular application. Compile these from the selection factors discussed on the next four pages and compare them to the clutch specifications found on pages 7 through 24 to find the correct clutch for your application.

Clutch Dimensions

Overall or envelope dimensions of a clutch being considered for an application must be noted to ensure that the clutch will fit into the space allotted.

Choosing the Correct Size Clutch

Torque and horsepower calculations are important in choosing the right clutch for your application.

Two important factors needed to determine the static torque required for an application are the driven machine's horsepower and clutch operating speed. Locate horsepower and clutch RPM on their respective columns in the accompanying chart. Draw a straight line between the two points. The torque is the numerical value read from where this line intersects the TORQUE column. This number must be multiplied by a known service factor "K" from the data below to obtain the correct torque requirement for the clutch.

Service Factor "K"

The power pulses of a gasoline or diesel engine result in momentary torque output which is several times higher than the engine's rated torque. Many electric motors can also deliver up to three times their rated output for a short period. A clutch coupled to these power systems must be able to transmit the required torque for these short periods without slipping. Using the chart at right, estimate the "K" service factor which is appropriate for your application.

Torque Determination Chart

Horsepower / Nomograph
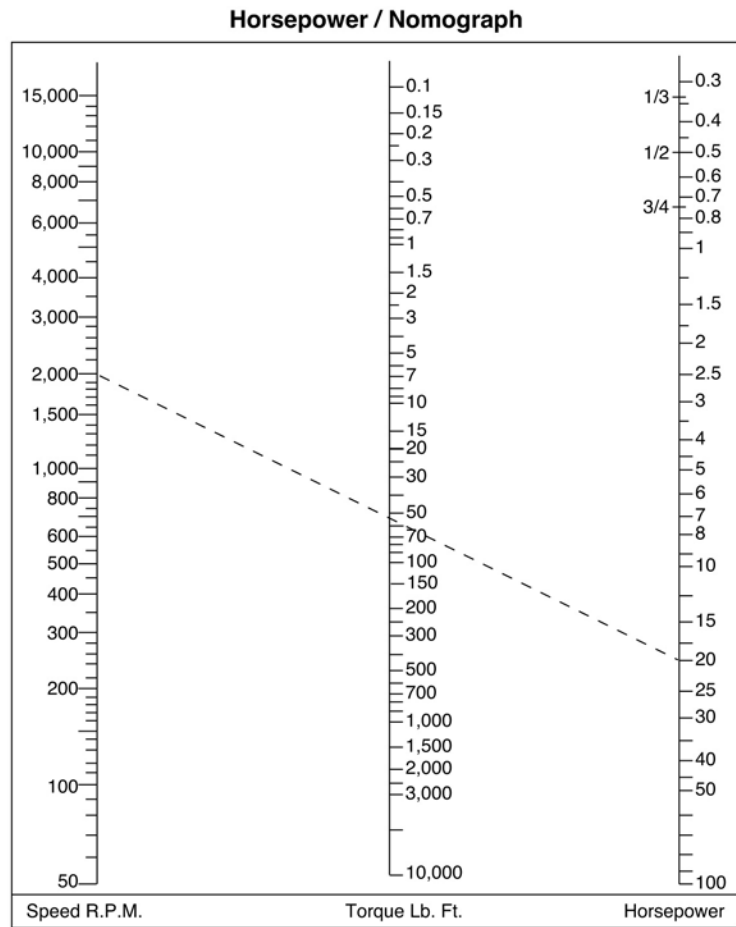
Type of Application	"K Range"
Conveyor and augers where a static load must be started by the dynamic torque of the clutch.	K = 3 to 5
Hydralic pumps where the clutch may have to work against pressure at time of engagement	K = 2.5 to 5
Gasoline or diesel engines where the clutch should be able to stall the engine.	K = 2 to 5
Air compressors	K = 2 to 4
Electric motors where the clutch should be able to stall the motor. Use the overload factor from the motor catalog or use.	K = 2 to 3
Light machines where the load is applied after the clutch is engaged. (e.g. a lathe)	K = 1.5 to 2.5

Example

A 10 horsepower pump driven by an electric motor operates at 1500 RPM. Using 3 as the value of the "K" factor, determine the required clutch torque capacity.

> 10 HP at 1500 RPM = 35 lb.ft. torque
> "K" factor 3 x 40 lb.ft. = 105 lb.ft. torque.

This application will require a clutch with a static torque rating of 105 lb.ft.

Static torque can also be calculated by using the following formula:

$$T = \frac{5250 \times HP \times K}{RPM}$$

Example

A truck mounted hydraulic pump requires 8 horsepower to operate at 2000 RPM. What is the required clutch torque rating?

Using a service factor of 5:

$$T = \frac{5250 \times 8 \times 5}{2000}$$

T = 105 lb.ft.

A clutch with a static torque capacity of 105 lb.ft. is required for this application.

Fluid Power Formula

$$T = \frac{HP \times 5250 \times K}{RPM}$$

$$T = \frac{CIR \times PSI}{75.4}$$

Where:

T = Torque (lb. ft.)
HP = Horsepower
RPM = Speed of Clutch (revolutions per minute)
CIR = Cubic inch per revolution (hydralic pump)
PSI = Pounds per square inch
"K" = Service factor (see chart on page 3)

If HP is unknown:

$$HP = \frac{GPM \times PSI \times .000583}{Pump\ efficiency}$$

Where:

GPM = Fluid flow in gallons per minute
PSI = Pressure in pounds per square inch
Pump efficiency = normally 85%

Rule of Thumb:

1 HP per gallon @ 1500psi
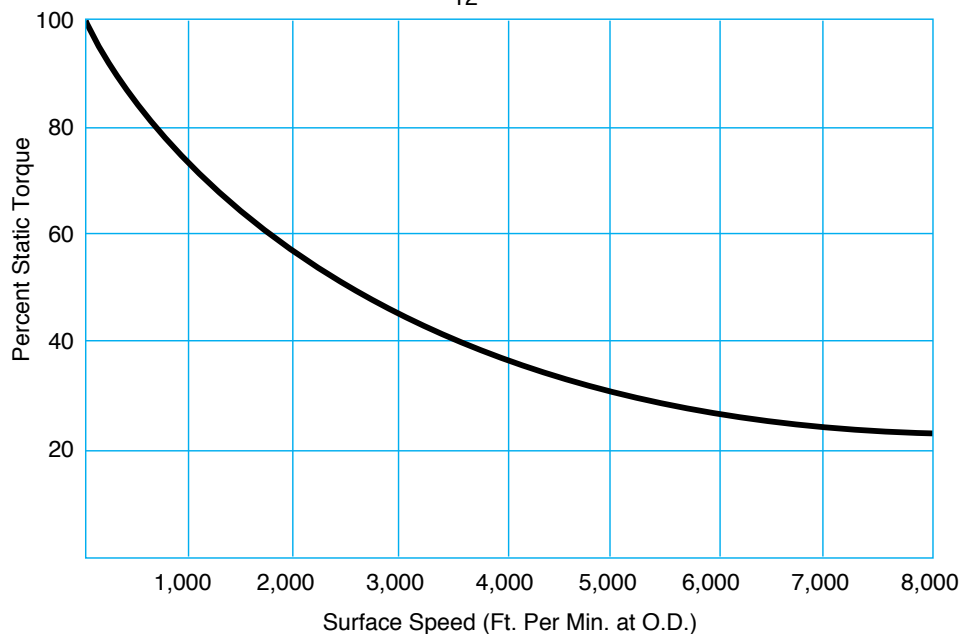.7 HP per gallon @ 1000psi

If PSI is unknown:
1 cubic inch per revolution equals 16 lb.in. of torque per 100 psi.
1 gallon equals 231 cubic inches.

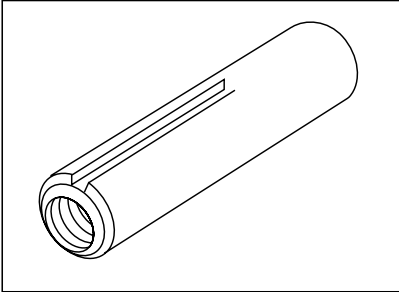## TYPICAL DYNAMIC TORQUE

Dynamic Torque as Percent of Static Torque

$$FPM = RPM \times \frac{3.14}{12} \times Diameter\ (of\ clutch)$$

Graph: Percent Static Torque (y-axis, 20 to 100) vs. Surface Speed (Ft. Per Min. at O.D.) (x-axis, 1,000 to 8,000)
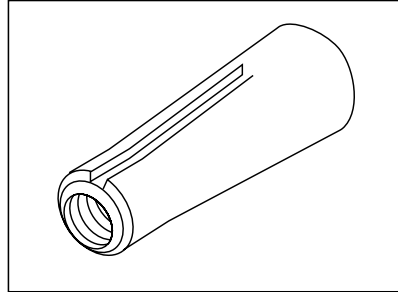
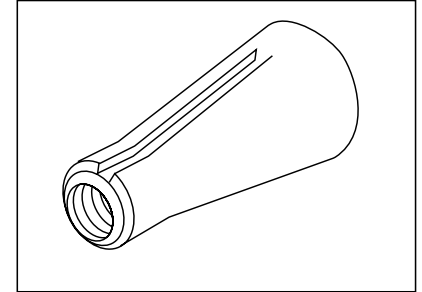# Engine, Pump and Compressor Clutches- Selection

Shafts

Warner Electric standard clutches are available to adapt to three different shaft configurations:

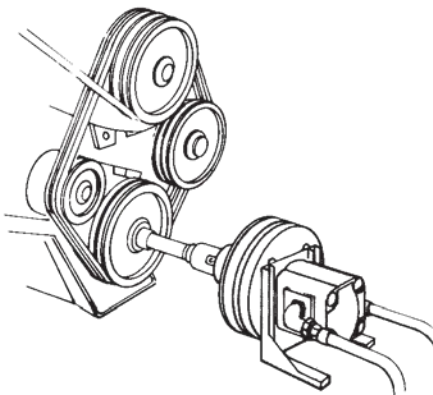**Straight bore** - for through shaft or end of shaft mounting.

Tapered bore (8:1) - shaft tapers 11/2 inches per foot, for end of shaft mounting.

Tapered bore (4:1) - shaft tapers three inches per foot, for end of shaft mounting.

Types of Drives

Warner Electric offers clutches which are compatible with the three basic types of drives.

Direct Drive
In direct drive arrangements, a drive shaft with a universal joint or other flexible coupling is attached to the engine crankshaft or transmission PTO on one end and the pump or compressor on the other. The clutch usually mounts on the pump or compressor. The "yoke drive" clutches in this section are equipped with flanges designed to bolt directly to a universal joint assembly.
Drive shaft alignment must be within 3°.
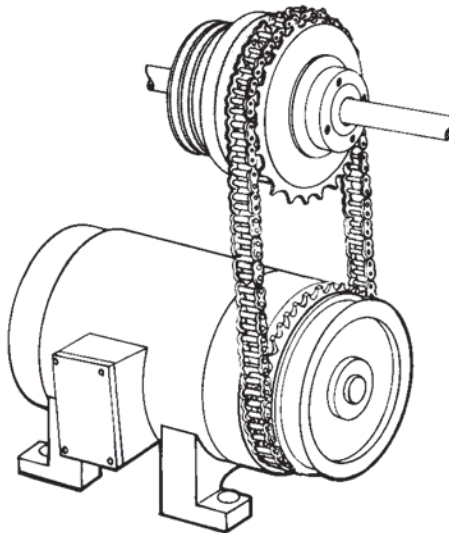
Parallel Shaft
In parallel shaft applications, torque is transmitted from a drive or line shaft to the pump, compressor or other accessory which is mounted parallel to it. The straight bore clutches with bearing mounted fields are often used in this drive arrangement. Belt or chain drives are most frequently used in parallel shaft applications.
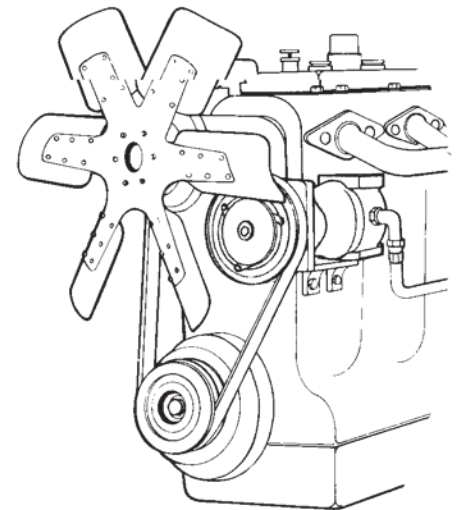
Belt Drive
The most common method of driving mobile accessories is through automotive or industrial belts. The driven accessory is parallel to and driven by a pulley mounted on the engine crankshaft. The relative diameters of the drive and driven pulleys, speed range of the engine, and required pump or compressor performance are all factors to be considered when selecting a belt driven clutch. Warner Electric clutches have AB grooved pulleys, which permit the use of either an A or B V-belt.

Electrical

Electrical Ratings

All current and resistance ratings are taken at ambient temperatures of 70°F (20°C).

Voltage Requirements

Warner Electric clutches are normally furnished with 12 VDC coils. Clutches can be designed to accommodate other voltages.

Current Draw

Current draw for each clutch model is listed in the product specifications section of this section.

Resistance/Heat Dissipation

Electrical resistance increases with coil temperature. Since the increase in electrical resistance reduces coil current, the torque transmitted by the clutch will be reduced. In applications where heat dissipation from the clutch is not adequate, air from an external source should be forced over the clutch to ensure proper operation. Most Warner Electric clutches shown in this section have been designed to operate in typical under hood temperatures.
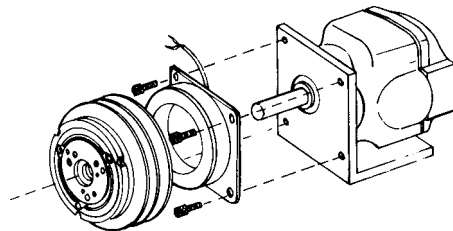
Clutch Mounting

Warner Electric clutches are offered with flange or bearing mounts. Select the type best suited for your application based on the information below.

Bearing Mounted Clutches

Bearing mounted clutches are preassembled into a complete operating unit which is mounted directly to the shaft. In this design, the field is mounted on its own bearing as an internal part of the clutch and has an antirotation tang to prevent it from turning in operation. This antirotation tang is to be pinned LOOSELY to a member or held with a torque arm.

Flange Mounted Clutches

In a flange mount clutch application, the field is bolted directly to a fixed member on either the output (engine crankcase or electric motor) or the driven accessory (input). Mounting brackets and fixtures for a specific application must be designed in accordance with the clutch dimensions found in the specifications section to ensure proper perpendicularity and concentricity.

Clutch Location

Wherever possible, the clutch should be located on the higher speed shaft.

Clutch Rotation

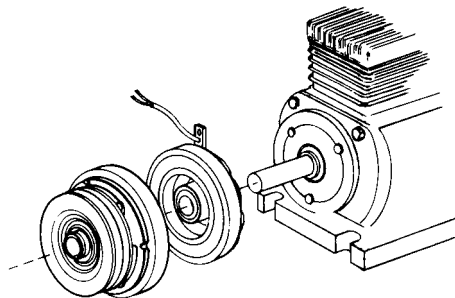Direction of drive can be a significant design consideration in applications with a peak load during clutch engagement. Warner Electric clutches incorporate leaf springs in the armature to transmit the load. When peak loads at start-up are possible, springs should be oriented so that they are placed in tension (stretch). Clutch rotation can be determined by observing the leaf spring direction on the armature.

Tapered Bore Clutches

(Flange Mount, Single Row Bearing)

3

4

Field
(Common)

4x .256/.250 Dia. Holes

3.396

1.698

2.281

4.562

Notes:

All dimensions are inches.
All units 12V unless otherwise indicated

A	Clutch Type	B	X	Y	Groove Size			Gage Line	Current[1] Draw Amps	Resistance Ohms[1]	Static Torque lb ft	Rotation	Model No.
					C	D	E						
6.00	3	2.44	.89	.62	.50	.42	36º	.841	4.651	2.58	75	CW	1411-18
6.00	3	2.44	.89	.62	.50	.42	36º	.841	2.59	9.28	75	CW	1411-35[2]
7.00	4	2.50	.89	.62	.50	.55	36º	.841	4.651	2.58	75	CW	1411-72

[1]Cold current draw   [2]24V

Tapered Bore Clutches

(Flange or Yoke Direct Drive,

Double Row Bearing)

Fields

4x .256/.250 Dia. Holes

F1

3.396

1.698

2.281

4.562

1

B

X

A

3.125 ø

2.379
2.377 ø

3/8-24 UNF-2B THD
(4 Holes)

Notes:

All dimensions are inches.
All units 12V unless otherwise indicated

Drive shaft alignment must be within 3° maximum.

(Clutch centerline must be within 3° of power source centerline)

A	Clutch Type	Field Type	B	X	Y	Groove Size			Gage Line	Current[1] Draw Amps	Resistance Ohms[1]	Static Torque lb ft.	Rotation	Model No.
						C	D	E						
6.14	1	F1	4.42	3.72	-	-	-	-	.841	4.58	2.62	200	CCW	1415-1

[1]Cold current draw
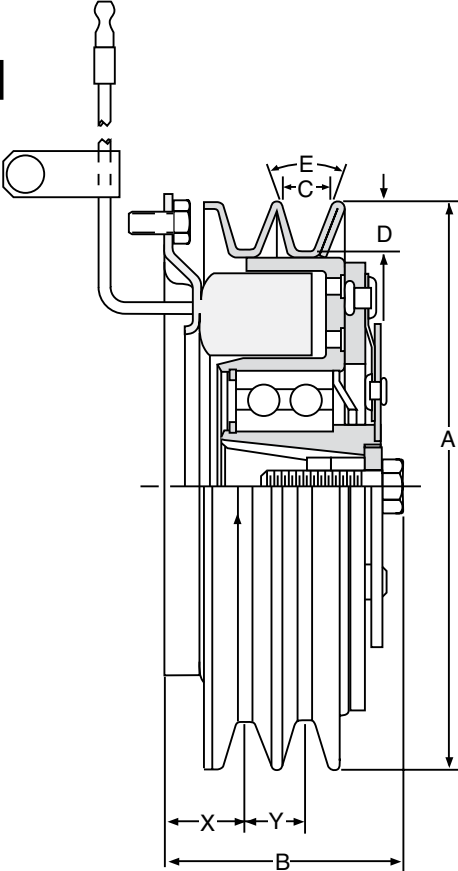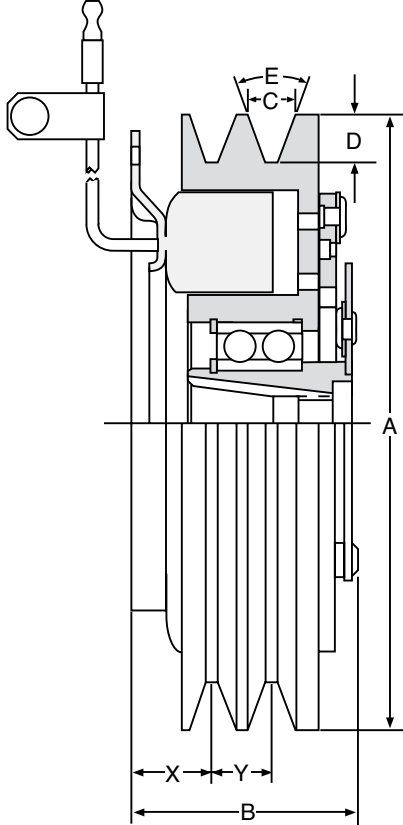
Tapered Bore Clutches

(Flange Mount, Single Row Bearing)

Tapered Bore Clutches

(Flange Mount, Double Row Bearing)

Fields

Notes:

All dimensions are inches.
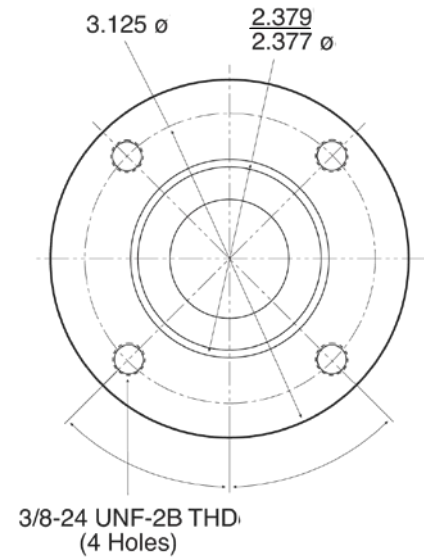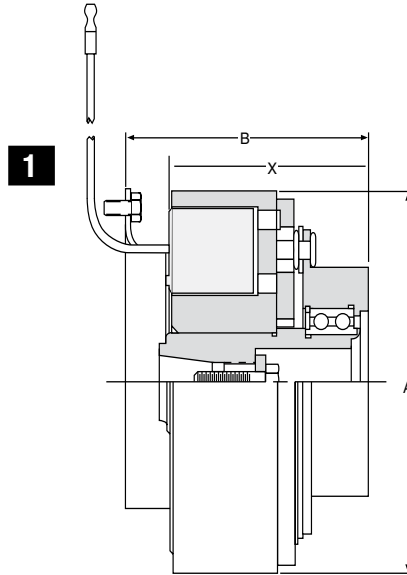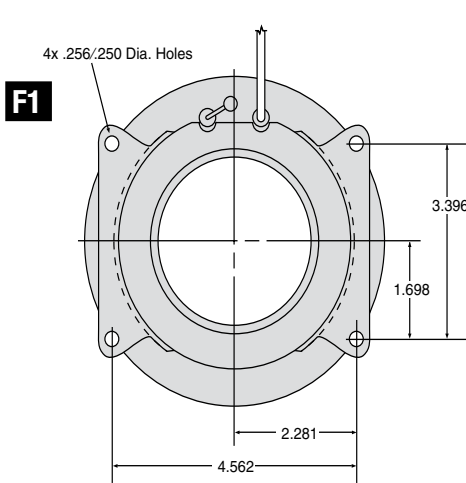All units 12V unless otherwise indicated

| A | Clutch Type | Field Type | B | X | Y | Groove Size | | | Gage Line | Current[1] Draw Amps | Resistance Ohms[1] | Static Torque lb ft | Rotation | Model No. |
						C	D	E						
6.00	2	F1	2.50	.91	.62	.50	.42	36°	.841	4.651	2.58	75	CW	1411-39
6.00	2	F1	2.50	.91	.62	.50	.42	36°	.841	2.59	9.28	75	CW	1411-50[2]
6.00	2	F1	2.51	.91	.62	.50	.42	36°	.841	4.36	2.752	90	CW	1411-55[3]
6.00	2	F1	2.46	.91	.62	.50	.42	36°	.841	4.651	2.58	75	CW	1411-68[3]
6.00	2	F1	2.54	.91	.62	.50	.42	36°	.841	4.651	2.58	75	CW	1411-54[3]
6.70	4	F1	2.57	.88	.62	.50	.55	36°	.841	4.952	2.423	120	CW	1466-53
7.00	2	F1	2.50	.91	.62	.50	.56	36°	.841	4.651	2.58	75	CW	1411-41
7.00	2	F1	2.50	.91	.62	.50	.56	36°	.841	4.36	2.752	90	CW	1411-42
7.00	2	F1	2.50	.91	.62	.50	.56	36°	.841	2.59	9.28	75	CW	1411-86[2]

[1]Cold current draw   [2]24V   [3]Special terminal

Engine, Pump and Compressor Clutches- Dimensions

Tapered Bore Clutches

(Flange Mount, Double Row Bearing)

Same Field as page 12

Notes:

All dimensions are inches.
All units 12V unless otherwise indicated

A	Clutch Type	B	X	Y	Groove Size			Gage Line	Current[1] Draw Amps	Resistance Ohms[1]	Static Torque lb ft	Rotation	Model No.
					C	D	E						
6.00	2	2.48	.93	-	.60	.52	38°	.841	4.55	2.64	75	CW	1466-69
6.70	4	2.79	2.38	-	.50	.50	36°	.841	4.55	2.64	75	CW	1406-19
6.70	4	2.79	2.38	-	.50	.50	36°	.841	2.545	9.43	75	CW	1436-41[2]
6.70	4	2.79	2.05	-	.50	.50	36°	.841	2.545	9.43	75	CW	1436-48[2]
6.70	4	2.79	2.05	-	.60	.56	38°	.841	4.55	2.64	75	CW	1406-43

[1]Cold current draw   [2]24V

Tapered Bore Clutches

(Flange Mount, Double Row Bearing)

Fields

(Common)

4X .256/.250 Dia. Holes

3.396

1.698

2.281

4.562

Notes:

All dimensions are inches.
All units 12V unless otherwise indicated

A	Clutch Type	B	X	Y	Groove Size			Gage Line	Current[1] Draw Amps	Resistance Ohms[1]	Static Torque lb ft	Rotation	Model No.
					C	D	E						
6.70	2	2.48	1.02	-	.60	.56	38º	.841	2.545	9.43	75	CW	1436-49[2]

[1]Cold current draw   [2]24V

Engine, Pump and Compressor Clutches- Dimensions

Tapered Bore Clutches

(Flange Mount, Double Row Bearing)

Same Field as page 12

Notes:

All dimensions are inches.
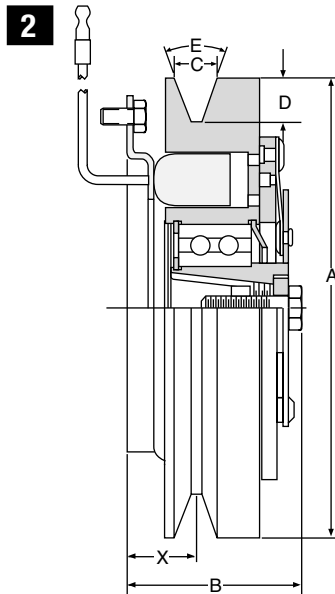All units 12V unless otherwise indicated

A	Clutch Type	B	Number of Grooves	X	Y	Groove Size			Gage Line	Current[1] Draw Amps	Resistance Ohms[1]	Static Torque lb ft	Rotation	Model No.
						C	D	E						
6.70	1	2.48	1	1.02	-	.50	.50	36º	.841	2.50	9.61	75	CW	1466-68[2,3]
6.70	1	2.48	1	.87	-	.50	.50	36º	.841	2.545	9.43	75	CW	1466-84[2]
6.70	2	2.97	1	2.29	-	.78	.68	38º	.841	4.651	2.58	75	CW	1411-49
6.70	2	2.52	1	1.95	-	.50	.50	36º	.841	4.651	2.58	75	CW	1411-70

[1]Cold current draw   [2]24V   [3]Special terminal

Tapered Bore Clutches

(Flange Mount, Double Row Bearing)

Same Field as page 12

Field

(1466-99 only)

3.125

4.00

Notes:

All dimensions are inches.
All units 12V unless otherwise indicated

| A | Clutch Type | B | Number of Grooves | X | Y | Groove Size | | | Gage Line | Current[1] Draw Amps | Resistance Ohms[1] | Static Torque lb ft | Rotation | Model No. |
						C	D	E						
5.82	4	2.76	8	1.16	.14	.14	.14	40°	.841	4.89	2.45	180	CW	1417-44
6.00	3	2.71	8	.89	.14	.14	.14	40°	.841	4.35	2.42	100	CW	1417-42
6.00	3	2.71	8	.89	.14	.14	.13	40°	.841	4.35	2.42	100	CW	1473-69
6.00	5	2.71	10	.85	.14	.14	.14	40°	.841	4.35	2.42	100	CW	1417-49

[1]Cold current draw   [2]24V   [4]A/B groove

Engine, Pump and Compressor Clutches- Dimensions

Tapered Bore Clutches

(Special Construction, Flange Mount, Double Row Bearing)

Fields

(Common)

4x .256/.250 Dia. Holes

3.396

1.698

2.281

4.562
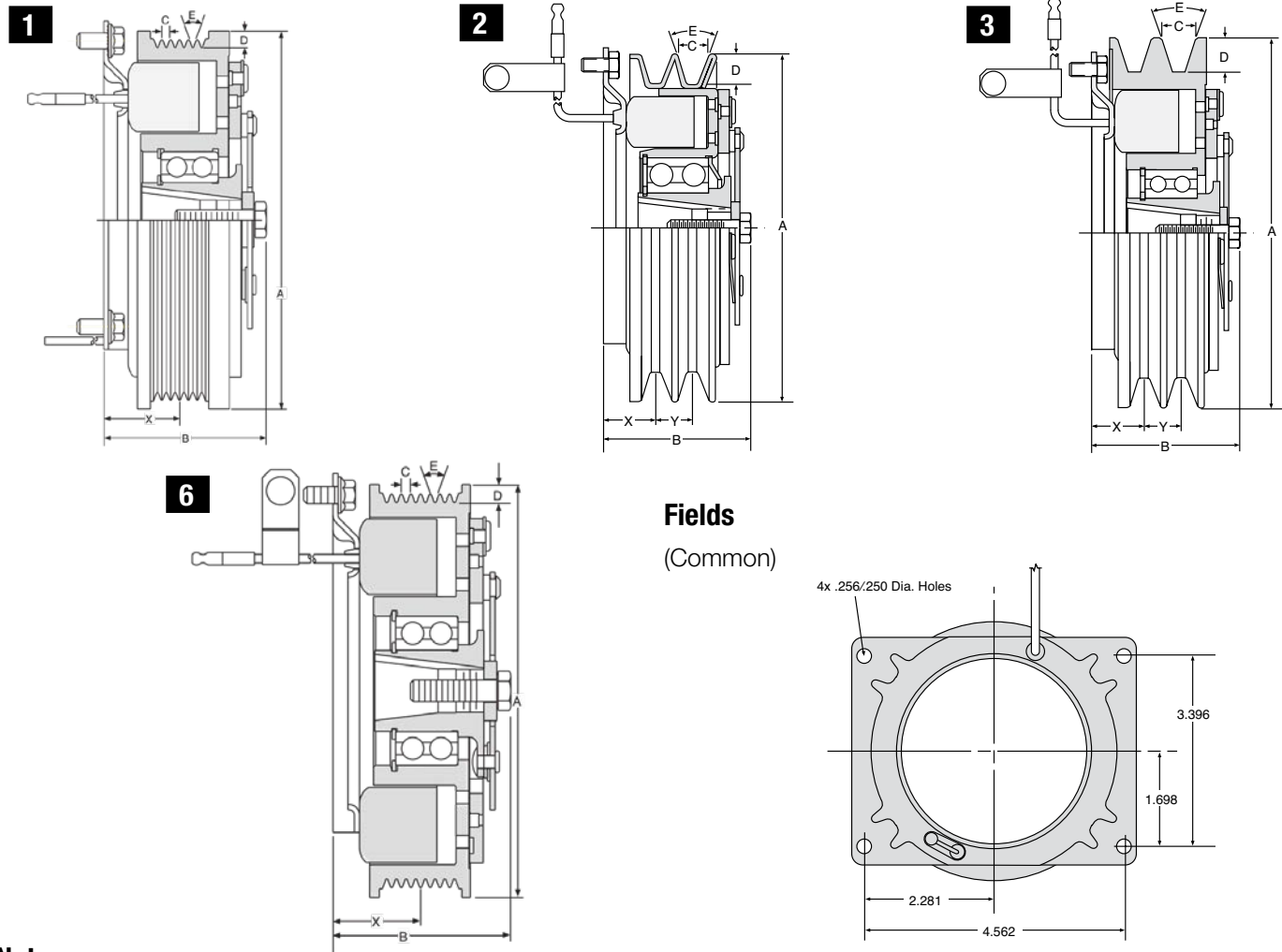
Notes:

Clutches on this page are specially constructed to withstand more severe operating environments.
All dimensions are inches. All units 12V unless otherwise indicated.

A	Clutch Type	B	Number of Grooves	X	Y	Groove Size C	D	E	Gage Line	Current[1] Draw Amps	Resistance Ohms[1]	Static Torque lb ft	Rotation	Model No.
5.75	1	2.57	6	1.20	-	.14	.14	40°	.841	4.952	2.423	120	CW	1417-11
5.80	6	2.61	6	1.20	.14	.14	.14	40°	.841	2.47	9.73	100	CW	1417-41[4]
6.00	2	2.52	2	.91	.62	.50	.42	36°	.75	4.36	2.752	90	CW	1417-2[2]
6.00	2	2.57	2	.91	.62	.50	.42	36°	.841	4.36	2.752	90	CW	1417-8
6.22	3	2.46	2	.85	.73	.61	.64	34°	.841	4.36	2.752	90	CW	1417-9
6.70	3	2.57	2	.88	.62	.50	.55	36°	.841	4.952	2.423	120	CW	1417-4
7.00	2	2.52	2	.91	.62	.50	.55	36°	.75	4.36	2.752	90	CW	1417-1[2]

[1]Cold current draw   [2]8:1 Taper   [4]A/B groove   [2]24V

Engine, Pump and Compressor Clutches- Dimensions

Straight Bore Clutches

(Bearing Mount)

Armatures
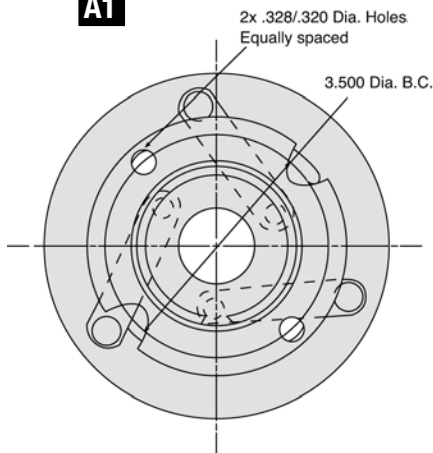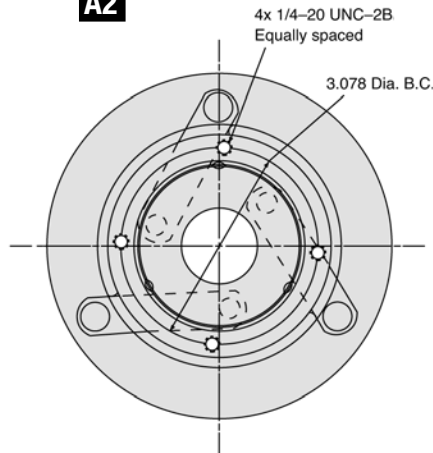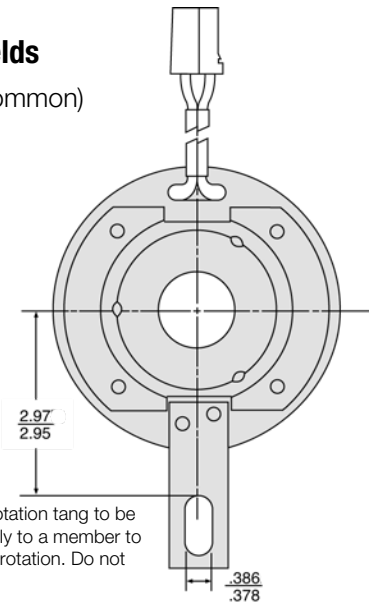
2x .328/.320 Dia. Holes Equally spaced

3.500 Dia. B.C.

4x 1/4–20 UNC–2B Equally spaced

3.078 Dia. B.C.

Fields

(Common)

2.97 / 2.95

Typical antirotation tang to be pinned loosely to a member to prevent field rotation. Do not bolt rigidly.

.386 / .378

Notes:

All dimensions are inches.
All units 12V unless otherwise indicated

Bore Size	Clutch Type	Armature Type	A	B	X	C	Static Torque lb ft	Current[1] Draw Amps	Resistance Ohms[1]	Rotation	Keyway	Model No.
3/4"	2	A2	2.64	3.31	2.60	2.635	80	.56	161	CCW	.189	5215-105[2]
1"	1	A1	2.44	3.375	3.21	3.045	70	4.89	2.45	CCW	.25	5215-60

[1]Cold current draw   [2]90 Volts

Engine, Pump and Compressor Clutches- Dimensions
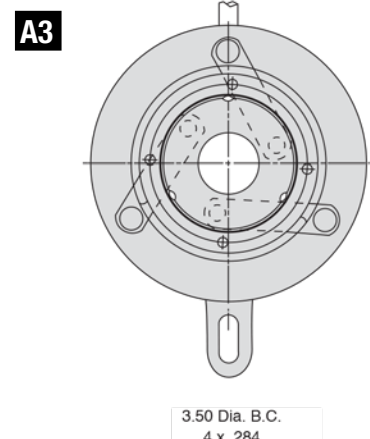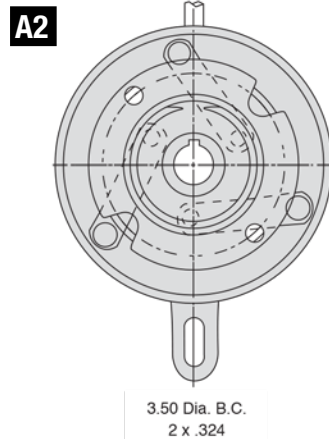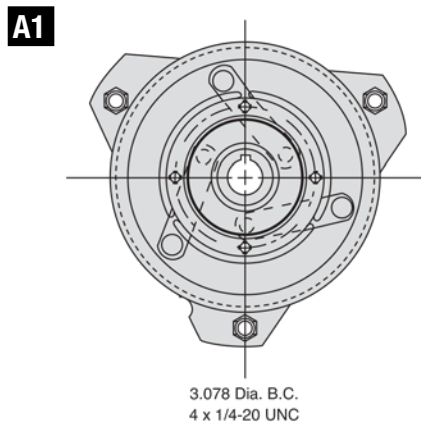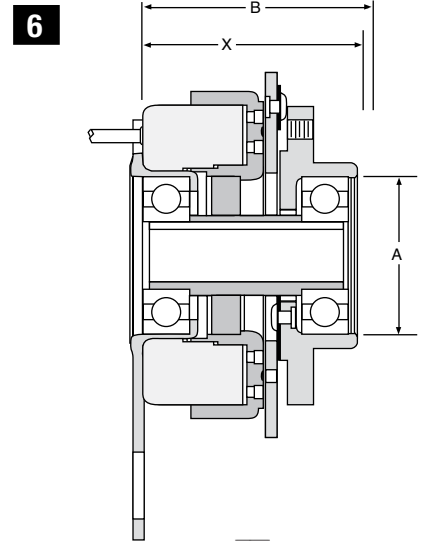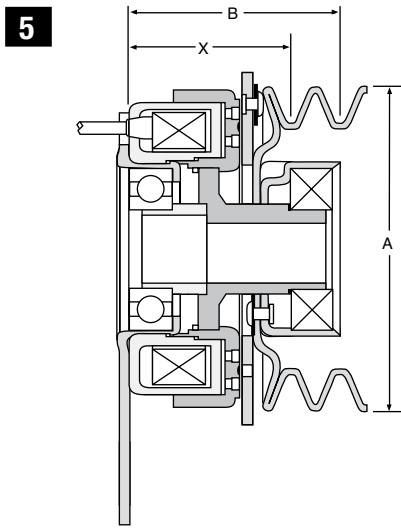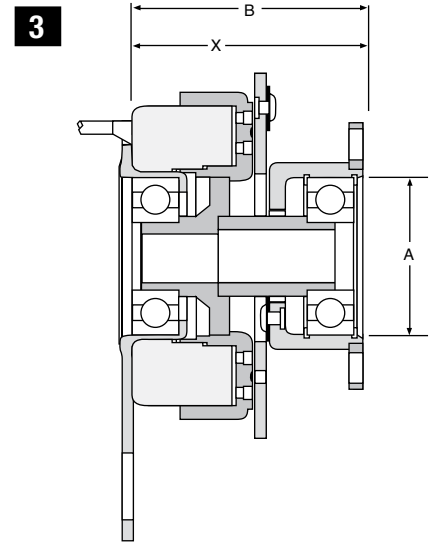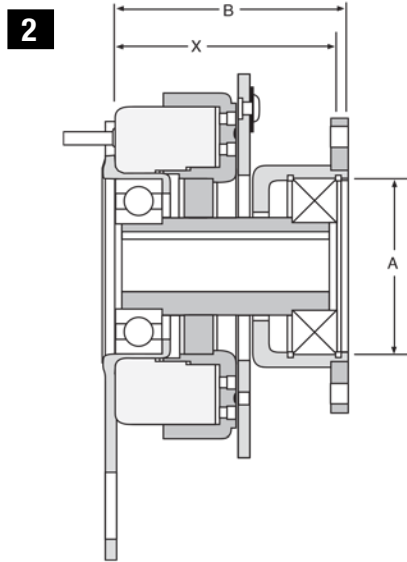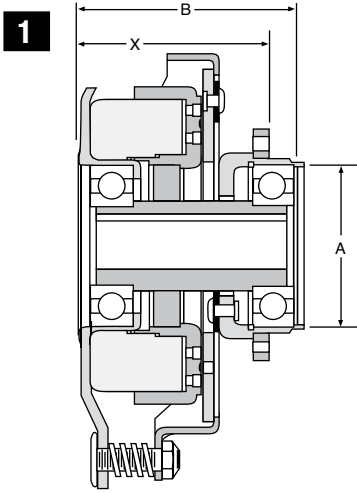
Straight Bore Clutches

(Bearing Mount)

3.078 Dia. B.C.
4 x 1/4-20 UNC

3.50 Dia. B.C.
2 x .324

3.50 Dia. B.C.
4 x .284

Straight Bore Clutches

(Bearing Mount)

A4

A5

A6

3.62 Dia. B.C.
3 x 5/16-18 UNC-2B

F1

.1895
2.75
.812
.56

F2

2.96
.90
.382
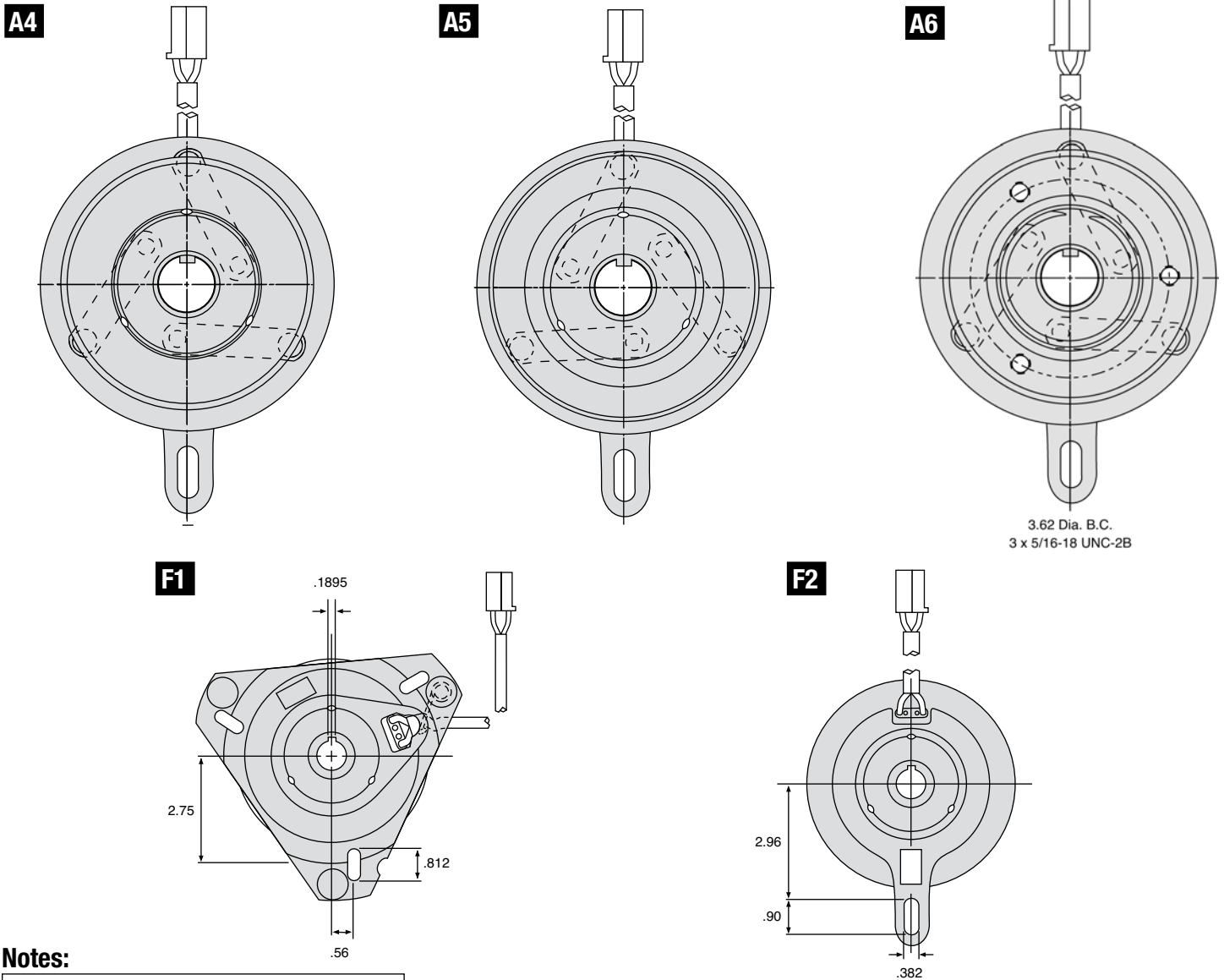
Notes:

All dimensions are inches.
All units 12V unless otherwise indicated

Bore Size	Clutch Type	Armature Type	Field Type	A	A Belt	B Belt	B	X	Y	C	D	E	Static Torque lb ft	Current[1] Draw Amps	Resistance Ohms[1]	Rotation	Keyway	Part No.
3/4"	1	A1	F1	2.64	-	-	3.41	2.95	-	-	-	-	105	4.51	2.66	CCW	.19	5215-66
3/4"	2	A2	F2	2.44	-	-	3.40	3.21	-	-	-	-	70	4.51	2.66	CCW	.19	5215-67
1"	3	A3	F2	2.64	-	-	2.96	2.60	-	-	-	-	105	4.84	2.48	CCW	.25	5215-57
1"	4	A4	F2	4.6	-	4.62	3.52	2.77	-	.63	.55	36°	70	4.51	2.66	CCW	.25	5215-63
1"	5	A5	F2	5.1	5.07	-	3.73	2.37	.67	.49	.48	34°	70	4.51	2.66	CW	.25	5215-77
1"	6	A6	F2	3.00	-	-	3.08	2.30	-	-	-	-	105	4.84	2.48	CCW	.25	5215-82

[1]Cold current draw

Engine, Pump and Compressor Clutches- Dimensions

Straight Bore Clutches

(Special Construction, Flange Mount)

(The clutches on this page include mounting hub)
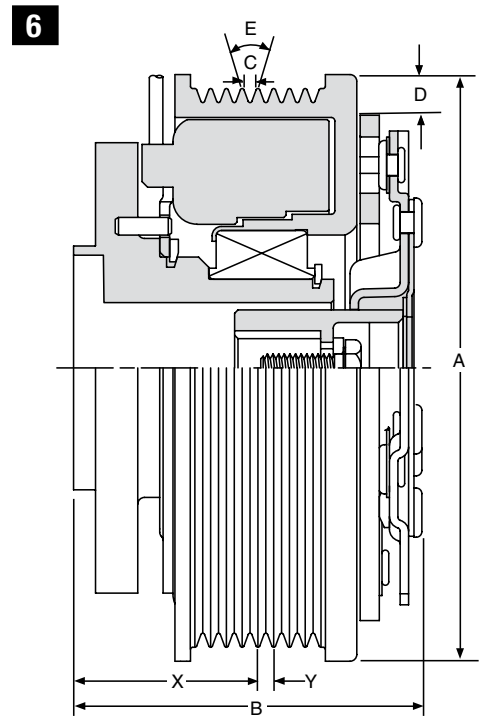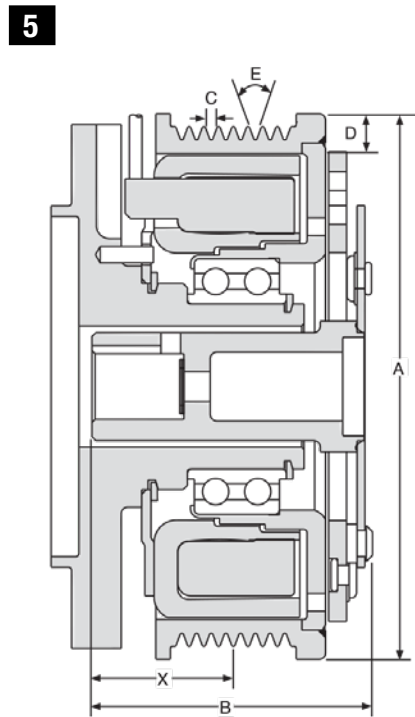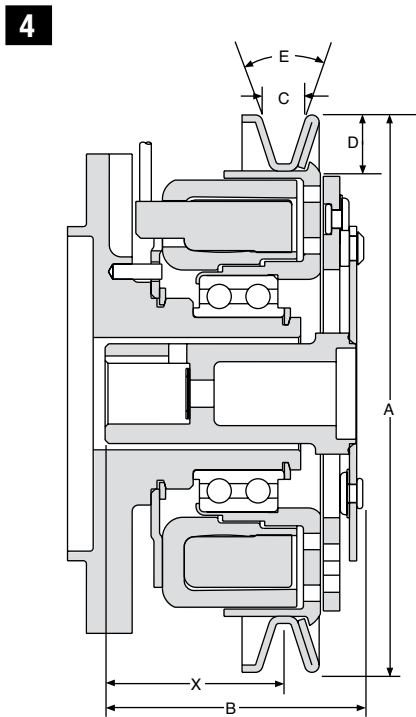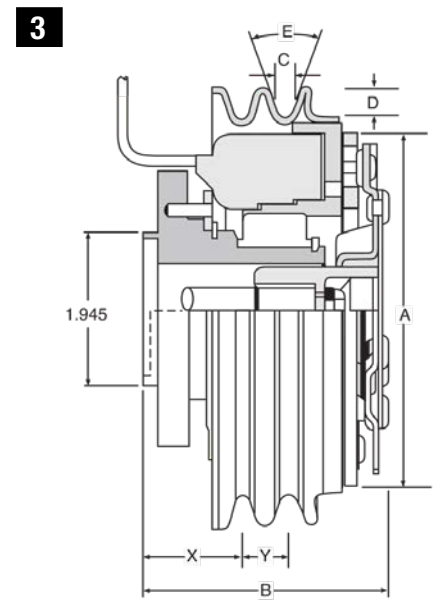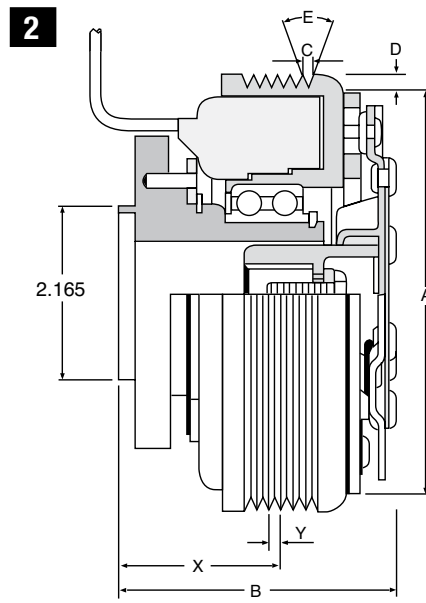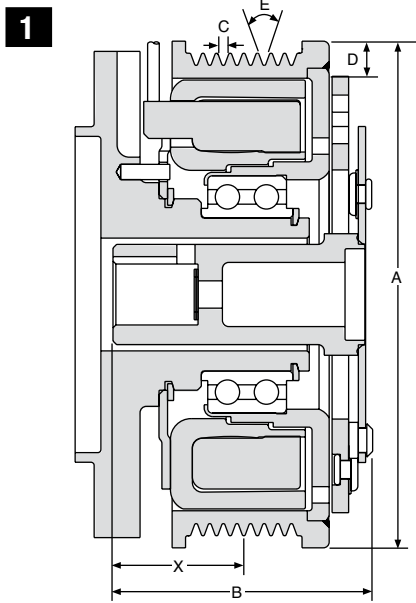
Engine, Pump and Compressor Clutches- Dimensions

Mounting Hubs

F1

4x 90

4x 5/16-24 UNF-2B

2.828

F2

3.228

ø4.000

2x 3/8-16 UNF-2B

F3

2x M10X1.5-6H

ø4.173

ø2.300

ø1.160

ø5.000
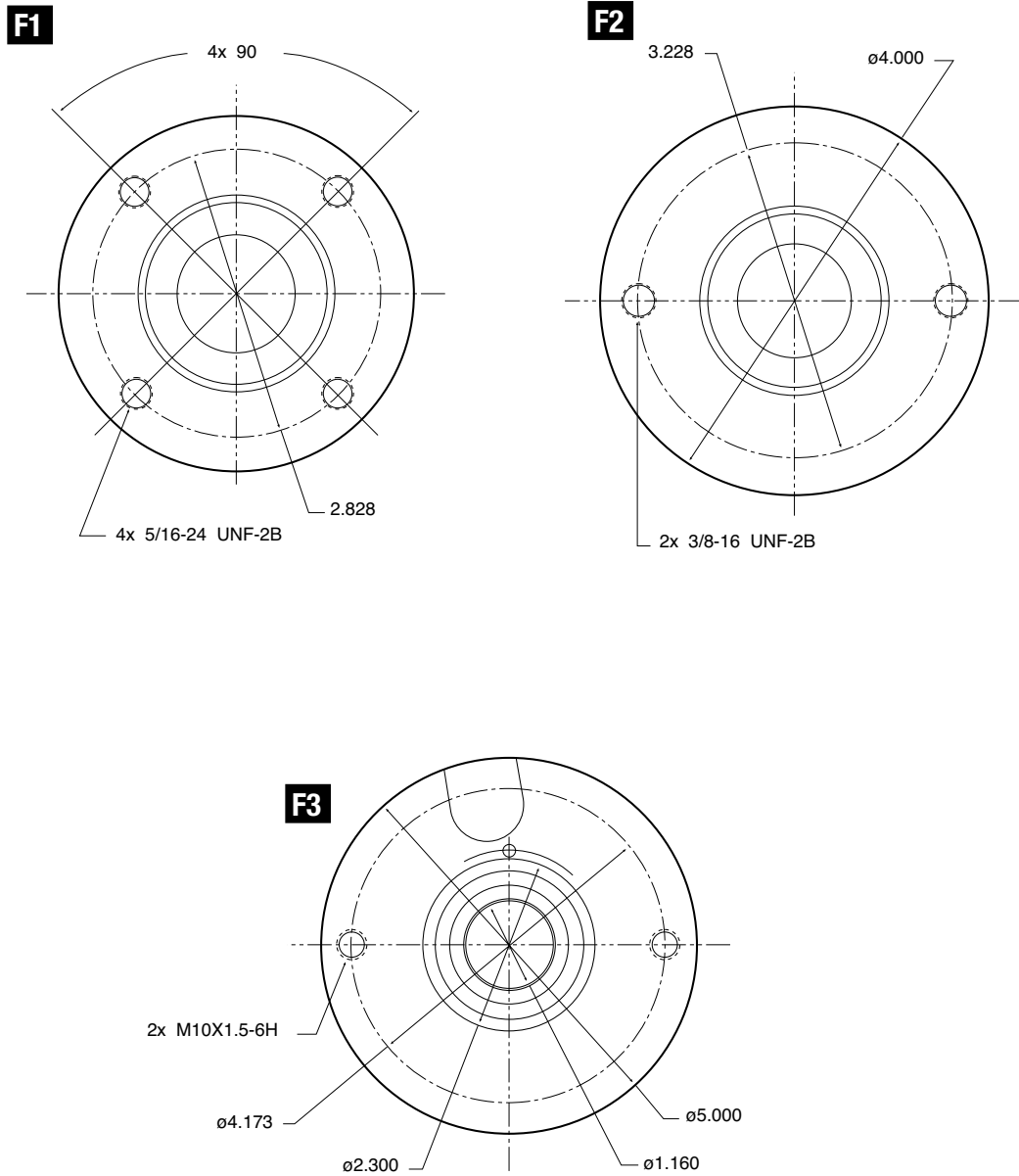
Notes:

All dimensions are inches.
All units 12V unless otherwise indicated

F3 Mounting hub fits AA mount pumps

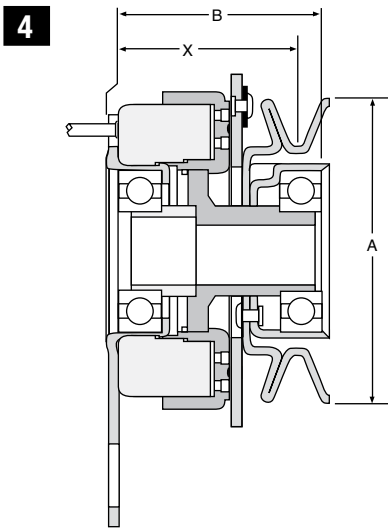| Bore Size	Clutch Type	Mounting Hub Type	A	B	X	Y	C	D	E	Static Torque lb ft	Current[1] Draw Amps	Resistance Ohms[1]	Rotation	Keyway	Model No.
1/2"	2	F2	4.91	3.19	1.24	.14	.14	.13	40°	90	4.92	2.44	CW	.16	1417-24
1/2"	3	F1	5.59	3.19	1.60	.56	.38	.36	36°	90	4.92	2.44	CW	.16	1417-26
.532	6	F2	4.96	2.95	1.44	.14	.14	.14	40°	70	4.63	2.59	CW	.16	1417-31
.627	4	F3	5.76	2.83	2.23	-	0.437	0.42	36°	90	2.523	9.513	CCW	0.158	1417-34[2]
.627	4	F3	5.76	2.83	2.23	-	0.437	0.42	36°	90	2.523	9.513	CW	0.158	1417-35[2]
.627	5	F3	5.00	2.83	1.54	0.14	0.14	0.14	40°	90	2.523	9.513	CW	0.158	1417-45[2]
.627	1	F3	5.00	2.83	1.54	0.14	0.14	0.14	40°	90	2.52	9.51	CW	0.158	1417-48

Straight Bore Clutches

(Special Constructions)

1

2

3

4

5

6

Fields

F1 — 4x .256/.250 Dia. Holes, 3.396, 1.698, 2.281, 4.562

F2 — 14.312

F3 — 6X Ø .437", Ø 4.750, 6X 60fl NOM

F4 — 6 x 1/2 – 13

F5 — 1/4", R 1.26", 1.971"

D1 — 2x 80, 4x 3/8 - 24 UNF-2B
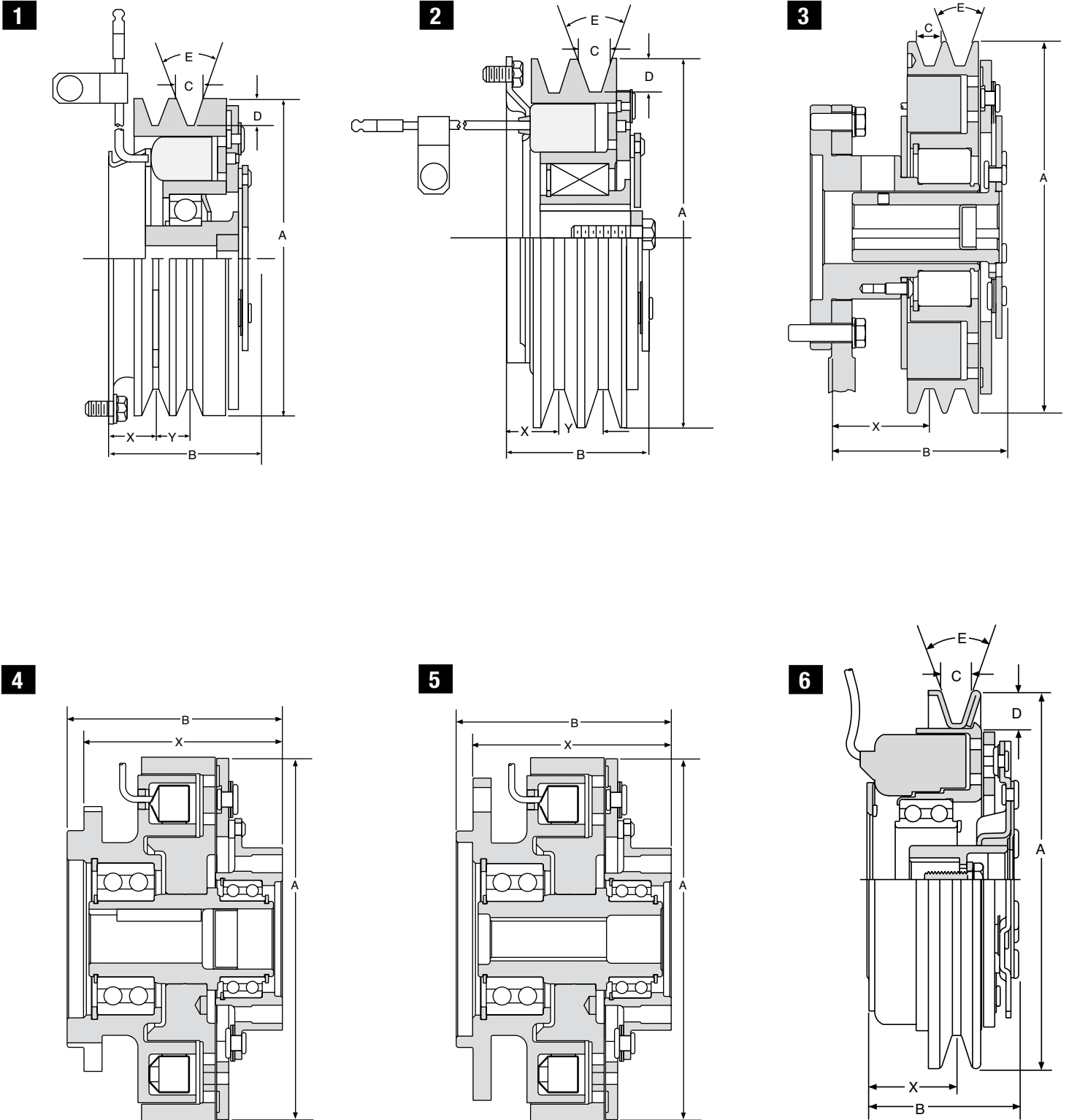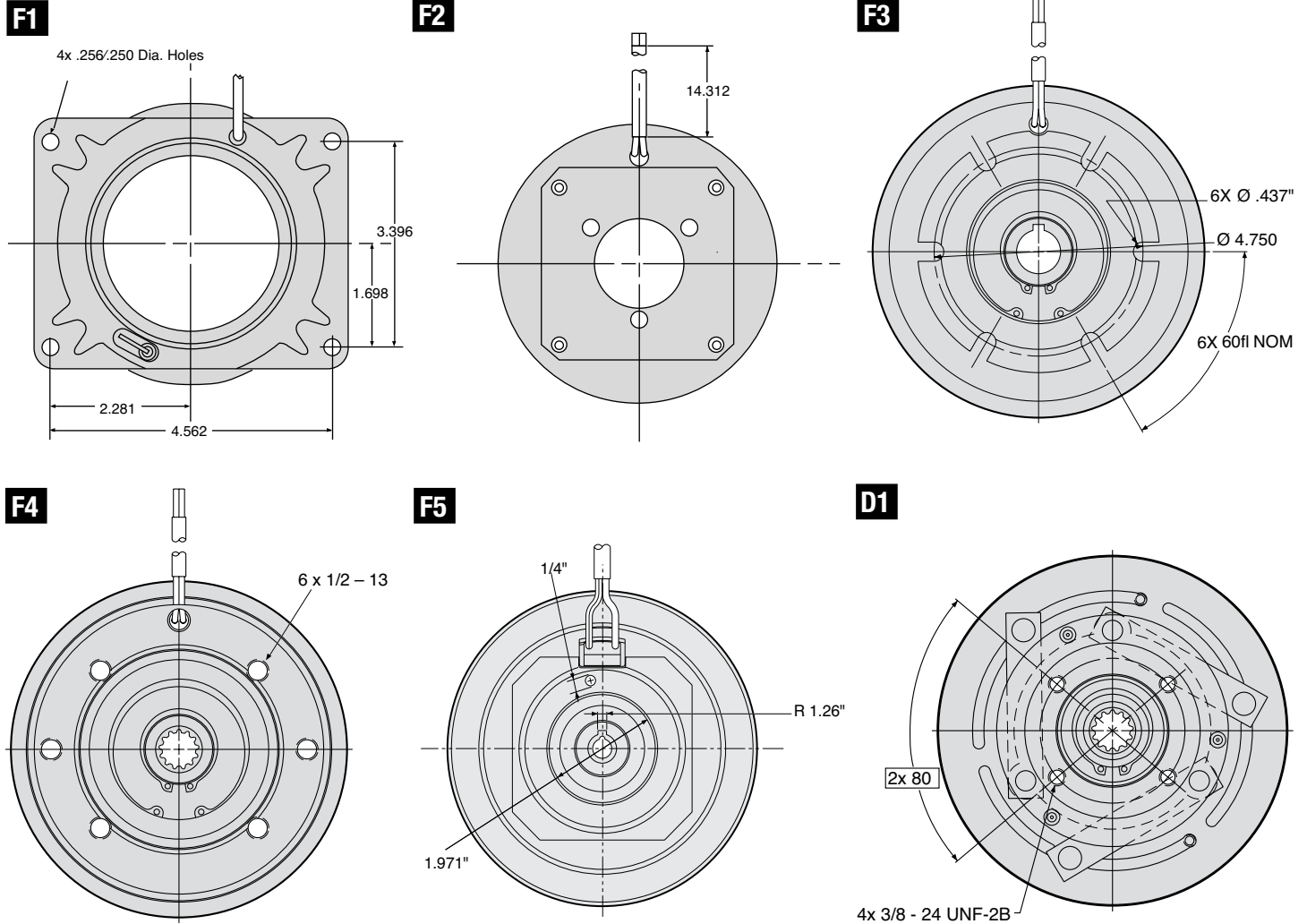
Notes:

All dimensions are inches.
All units 12V unless otherwise indicated

Bore Size	Clutch Type	Field Type	Drive Coupling	A	A Belt	B Belt	B	X	Y	C	D	E	Static Torque lb ft.	Current[1] Draw Amps	Resistance Ohms[1]	Rotation	Keyway	Model No.
9/16"	1	F1	-	5.98	5.73	-	2.63	.89	63	.51	.46	38º	75	4.55	2.65	CW	.127	1417-16
3/4"	2	F1	-	6.22	-	5.88	2.56	.85	.73	.61	.63	34º	90	4.36	2.752	CW	.189	1417-10
3/4"	2	F1	-	6.22	-	5.88	2.56	.85	.73	.61	.63	34º	90	2.59	9.28	CW	.189	1417-13[2]
1"	4	F3	D1	7.56	-	-	4.469	4.11	-	-	-	-	200	5.54	2.17	CCW	0.25	1415-5
Sp	5	F4	D1	7.56	-	-	4.469	4.11	-	-	-	-	200	5.54	2.17	CCW	-	1415-7[4]
1"	4	F3	D1	7.56	-	-	4.469	4.11	-	-	-	-	200	3.35	7.16	CCW	0.25	1415-8[2]
.532	6	F5	-	5.36	.44	-	2.43	1.37	-	.44	.42	36º	75	3.38	3.55	CW	0.16	1417-43

[1]Cold current draw   [2]24V   [3]For Gresen pump only
[4] 13 tooth spline hub clutches must be installed on pumps with internal involute flat root side fit splines per ANSI-B92.1.
Major diameter .901" max.
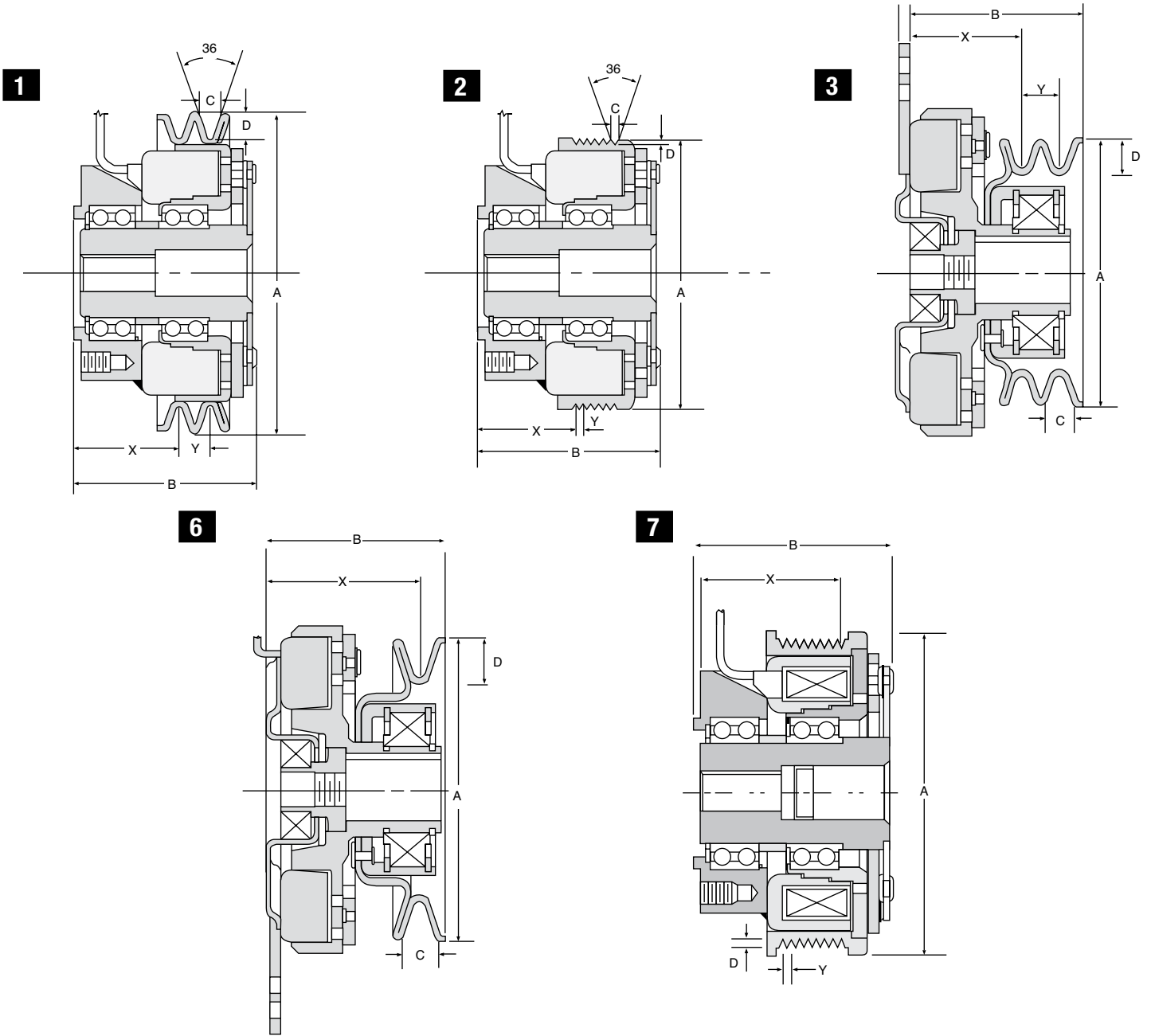
Straight Bore Clutches

(Shaft Mount)

Straight Bore Clutches

(Shaft Mount)

Fields
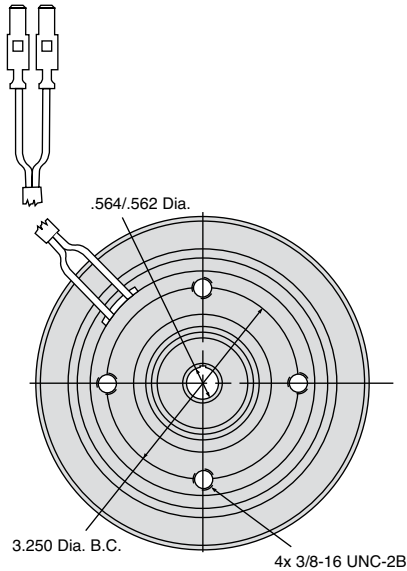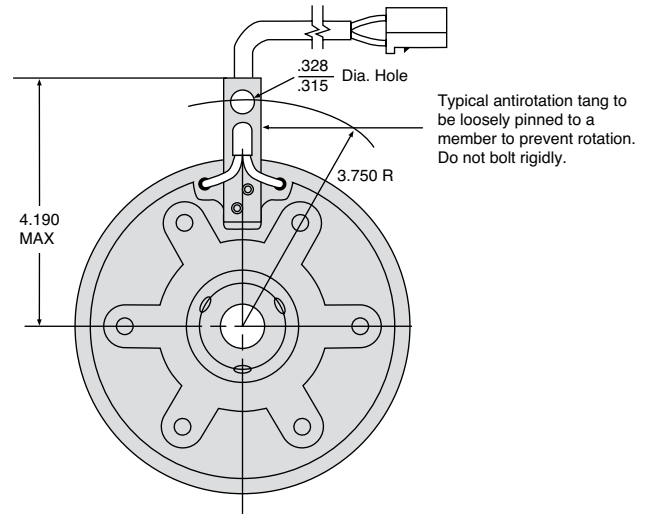
Notes:

All dimensions are inches.
All units 12V unless otherwise indicated

Bore Size	Clutch Type	Field Type	A	A Belt	B Belt	B	X	Y	C	D	Static Torque lb ft.	Current[1] Draw Amps	Resistance Ohms[1]	Rotation	Keyway	Model No.
9/16"	2	F1	5.00	-	-	3.30	1.74	.14	.120	.126	75	3.41	3.52	CW	.127	1417-15[2]
9/16"	1	F1	6.05	-	-	3.30	1.752	.65	.44	.46	75	3.41	3.52	CW	.127	1417-17
9/16"	1	F1	6.05	-	-	3.30	1.752	.65	.44	.46	75	2.53	9.51	CW	.127	1417-38[3]
9/16"	7	F1	6.00	-	-	3.34	2.308	.14	.120	.13	75	3.38	3.52	CW	.13	1417-28
1"	3	F2	4.93	4.50	-	3.48	2.027	.67	.49	.48	70	4.17	2.88	CCW	.25	5208-55
1 1/8"	3	F2	4.93	4.50	-	3.48	2.027	.67	.494	.48	70	4.17	2.88	CCW	.25	5208-29
1 1/8"	6	F2	5.36	4.74	5.08	3.34	2.52	-	.612	.632	70	4.17	2.88	CCW	.25	5208-40

[1]Cold current draw [2]Bracket mounting [3]24 Volt
For all models shown: E Nom. 1.18, F Max. .170, G Max. 1.20, H Max. 1.47.

Glossary

Acceleration Time, Engagement Time

The time required to change the speed of a system from the moment the clutch receives the appropriate electrical signal

until the clutch is fully engaged and the system is moving at its maximum speed.

Bearing Mount

A clutch which is preassembled into a complete operating unit and is mounted directly to the shaft.

Brushholder

A clutch component which carries electrical current from the lead wires to the rotating magnet.

Build Up Time

The time in seconds required to build up to 90% of rated flux which corresponds to 80% rated torque.

Burnishing

The process of cycling or "wearing in" of clutch or brake friction surfaces. This process ensures rated torque during initial cycles, and decreases the cycles required from installation to full rated torque output.

Decay Time

The time in seconds required to decay to 10% of rated flux which corresponds to 1% of rated torque on de-energization of the unit.

Deceleration Time, Engagement Time

The time required to stop a system from the moment the brake receives the appropriate electrical signal until the brake is statically engaged and the system is at rest.

Field

A component part of Warner Electric clutches consisting of a steel shell and a coil. Also referred to as a magnet.

Flange Mount

A clutch which has the field bolted directly to a fixed member on the machine.

Flux

Magnetic attraction caused by an electrical current.

Gap

The distance between armature and rotor faces in clutches when the unit is in an inactive state (i.e. disengaged).

Integral Key

A key shaped directly into the bore of a clutch. This is sometimes used in place of a standard keyway and key.

K Factor

See service factor.

Poles

1. Refers to magnet poles: North/South poles.
2. The edges of a Warner Electric magnet or field shell through which the magnetic flux flows.

Pulley

A sheave that turns or is turned by a belt so as to transmit torque, rotation.

Residual Magnetism

The condition in magnets where low level magnetism remains after the electric current is removed.

Rotor

The input member of a clutch/brake.

Service Factor

A figure by which torque is multiplied to ensure performance of the clutch under the worst case application conditions.

Tapered Bore (Shaft)

Many hydraulic pumps incorporate a taper on the output shaft, providing stronger clutch-to-shaft engagement than on straight shafts. Tapered shafts are most commonly in 4:1 and 8:1 taper ratios.

4:1 Taper: The shaft changes in diameter by one inch for each four inches of length.

8:1 Taper: The shaft changes in diameter by one inch for each eight inches of length.

Torque

Static: The torque which is developed when there is no relative motion or slippage between the mating friction surfaces. A clutch which is fully engaged and driving exhibits static torque. All standard units are rated on the basis of static torque after burnishing.

Dynamic: The torque developed when there is relative motion between the mating friction surface. The torque varies inversely with the amount of slip, so specific values must be taken from engineering data.

Clutch Location

Wherever possible, the clutch should be located on the higher speed shaft.

Clutch Rotation

Direction of drive can be a significant design consideration in applications with a peak load during clutch engagement. Warner Electric clutches incorporate leaf springs in the armature to transmit the load. Where peak loads at start-up are possible, springs should be oriented so that they are placed in tension (or stretch).

Spring rotation can be determined by observing the leaf spring direction on the armature.

Electrical Ratings

All current and resistance ratings are taken at ambient temperatures of 70ºF (20ºC).

Fluid Power Formula

If you are sizing a clutch for a pump application, but do not know the HP required, the following formula will allow you to work back to the torque formula.

If HP is unknown:

$$HP = \frac{GPM \times PSI \times .000583}{Pump\ Efficiency}$$

Where:

GPM = Fluid flow in gallons per minute
PSI = Pressure in pounds per square inch
Pump efficiency = normally 85%

Rule of Thumb:

1 HP per gallon @ 1500psi
.7 HP per gallon @ 1000psi

If PSI is unknown:

1 cubic inch per revolution equals 16 lb.in. of torque per 100 psi.
1 gallon equals 231 cubic inches.

If GPM is unknown:

$$GPM = \frac{RPM \times DISP\ (IN^3)}{231}$$

Static Torque

The torque requirements for your particular application may be determined by using the following relationship:

$$T = \frac{520 \times HP}{RPM}$$

$$T = \frac{CIR \times PSI}{75.4}$$

Voltage Requirements

Most clutches and clutch/brakes require 12 VDC to operate at their maximum torque rating. Less than 12 VDC may cause clutch slippage and premature failure.

Abbreviations:

T = Torque (lb. ft.)

HP = Horsepower

RPM = Speed of Clutch (revolutions per minute)

CIR = Cubic inch per revolution

PSI = Pounds per square inch

"K" = Service factor

Part Number Index

Warner	Page	Pitts	Ogura	Warner	Page	Pitts	Ogura	Warner	Page	Pitts	Ogura
1406-19	11	10595	502740	1417-12	15	-	-	5208-29	24	-	-
1406-34	12	10582	502731	1417-13	22	-	-	5208-40	24	-	-
1406-39	13	10581	502730	1417-14	24	13279	-	5208-55	24	-	-
		12016		1417-15	24	13829	-	5215-60	16	-	-
1406-41	14	10583	502744	1417-16	22	-	-	5215-57	18	-	-
1406-42	12	10047	502732	1417-17	24	-	-	5215-60	18	-	-
		10584		1417-18	15	-	-	5215-63	18	-	-
1406-43	11	10591	502736	1417-24	20	-	-	5215-66	18	-	-
1406-44	12	10596	502741	1417-26	20	-	-	5215-67	18	-	-
1406-47	12	10594	502739	1417-28	24	-	-	5215-77	18	-	-
		1274		1417-31	20	-	-	5215-82	18	-	-
1406-49	12	10587	502743	1417-34	20	-	-	5215-105	16	-	-
		10990		1417-35	20	-	-				
1406-70	7	7809	-	1417-38	24	-	-				
1406-97	14	10761	502400	1417-41	15	-	-				
1406-18	7	7531	332639	1417-42	14	-	-				
			(MA-6A)	1417-43	22	-	-				
1411-35	7	10204	-	1417-44	14	-	-				
1411-39	10	10884	501939	1417-45	20	-	-				
			(MAE-6AR)	1417-48	20	-	-				
1411-41	10	10089		1417-49	14	-	-				
		10795		1436-18	7	7810	502407				
		11153	502742			8167					
1411-42	10	-	-	1436-19	7	7873	-				
1411-49	13	11947	508821	1436-41	11	12748	-				
1411-50	10	11699	506121	1436-48	11	12743	-				
1411-54	10	-	-	1436-49	12	10871	-				
1411-55	10	-	-	1436-51	12	12741	506075				
1411-56	10	-	-	1436-55	12	12350	-				
1411-61	13	10590	502745	1436-78	7	7859	-				
1411-67	10	-	-	1436-90	7	7572	-				
1411-68	10	-	-			7811					
1411-69	10	-	-	1436-97	7	8134	501316				
1411-70	13	10586	502393				(MA-57/8M)				
1411-72	7	7534	332334	1466-20	11	7927	501589				
		12455	(MA-7A)			12740	505964				
1411-86	10	11212	506079	1466-21	10	7925	505966				
1411-96	10	-	-	1466-26	11	-	-				
1415-1	8	-	-	1466-53	10	13068	-				
1415-5	22	-	-	1466-64	11	-	-				
1415-7	22	-	-	1466-68	13	-	-				
1415-8	22	-	-	1466-69	11	11191	502722				
1417-1	15	-	-	1466-70	11	7928	502406				
1417-2	15	-	-	1466-84	13	11650	-				
1417-4	15	13068	-	1466-92	14	-	-				
1417-7	15	-	-	1466-105	13	-	-				
1417-8	15	-	-	1473-69	14	-	-				
1417-9	15	-	-	5208-3	24	-	-				
1417-10	22	10259	-	5208.4	24	-	-				
1417-11	15	13785	-								

Mobile Power Application Data Form

For Application Assistance, Phone 815-389-6369 or Fax 815-389-7648

Date _____

Company Name _____

Address _____

City _____

Type of Application

_____

_____

_____

Shaft Diameter (give limits)

☐ Straight _____

☐ Taper _____

Maximum Torque at Clutch

☐ Lb. Ft.

☐ HP at RPM's _____ _____

☐ GPM at PSI _____ _____

Power Source (give HP and Mfg)

☐ Gas _____

☐ Diesel_____

☐ Electric_____

☐ Other_____

Driven Load (give parameters)

☐ Air Compressor_____

☐ Pump_____

☐ Mower Deck_____

Electrical System

☐ Regulated _____

☐ Unregulated _____

Clutch Duty Cycle

(Time On/Off)/Hr_____

Environment

Temp Range _____ °F

Location_____

Quantity

Annual_____